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ABSTRACT

In response to criticism regarding unimaginative, didactic education in pharmacy education one faculty was evaluated by an outside consultant and, as a result, developed a comprehensive course in pharmacotherapeutics to help students integrate information from several disciplines and to become better problem solvers. In order to evaluate the course and identify objectives, a comprehensive data collection system was established to obtain information on participating students and faculty. The data were used immediately to determine where changes should be made in the course and to provide feedback to each teacher regarding instructional effectiveness. Three types of data were collected: demographic (lecture hours, number of objectives, etc.), course outcome data (student grade averages, examination scores), and student feedback. The course, which had been divided into 14 blocks, was evaluated in each block by the students. When students were asked to identify the percent of objectives met in the course, 82.6 percent indicated that at least 90 percent of the objectives were met. The results indicate the significance of the evaluation process. Beginning with alternative conceptual models and faculty training workshops, the faculty was able to implement a realistic model for a team-taught, multidisciplinary course. Questionnaire forms and tables showing statistical findings are attached. (PJM)

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THE RESULTS OF A TEAM TAUGHT, MULTI-DISCIPLINARY COURSE IN A SCHOOL OF PHARMACY

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OVERVIEW

This paper represents significant work in improving the quality of education in a School of Pharmacy. As a response to criticism regarding unimaginative, didatic education in pharmacy education (1), a faculty showed its willingness to risk new methodology and to be evaluated by an outside consultant in order to improve the process of delivering pharmacy education to its students.

The literature has shown that outside consultants generally have only immediate effect on a health related educational institution and its faculty (2,3). It has also been shown that training usually leads from resistence by faculty to some changes and an eventual return to the "old system." This article will describe a process and course which is counter to this trend and evolved into an overall positive change process.

As an outgrowth of implementing its new curricular objectives, the Philadelphia College of Pharmacy and Science (PCPS) developed a comprehensive course in Pharmacotherapeutics to help students integrate information from several disciplines and to become better problem solvers. It was envisioned that this course could become a model of team teaching for other schools of pharmacy.

In order to evaluate this course, a comprehensive data collection system was established to obtain information concerning the students and faculty who participated. This system was designed to ascertain to what extent the objectives of the course were being met which is not unusual. However, the uniqueness of this situation was the use of data immediately to determine where changes should be made in the course and to provide feedback to each instructor regarding his/her effectiveness. The total information was also used by the faculty as a whole to determine its applicability and usefulness to other curricular areas.

The data collected consisted of 40 variables for fourteen distinct blocks of instruction. This paper will describe the course, its outcomes, relative strengths and weaknesses, as well as reponses of students and faculty.

DEVELOPMENT OF COURSE

An outside consulting agency, Growth Unlimited, was asked by the Curriculum Development Committee (CDC) of the Phialdelphia College of Pharmacy and Science to help in the development of both process and product behavioral objectives to help in curriculum revision. The CDC had the responsibility of developing all the final objectives and presenting them to the faculty for their acceptance. As a result, PCPS needed to implement a curriculum based upon objectives in the affective as well as cognitive domains (4). The same consultants were then given a Merck Foundation grant in order to train the faculty to implement alternative methodologies of teaching and learning at the school. Several workshops (5) were developed modelling after work by Yanoff and Allender (6) and Yanoff, Allender and Landay (7) at the Unviersity of Louisville School of Dentistry. Bond and Anderson, using the training as background, developed a course in Pharmacotherapeutics utilizing a team teaching and multi-disciplinary approach to the teaching/learning process.

The course was designedto cover one whole year utilizing fourteen blocks of instruction. The CDC asked that four, five-credit courses in pharmacotherapeutics and a clerkship be assigned for second and third year students; this latter was to be the capstone course in various areas of pharmacy practice (community, hospital and clinical pharmacy). The course, known as Pharmacotherapeutics (PT) offered in the second professional year, was conceived as a way of bridging the gap between basic science coursework and the clerkship. This allowed for a streamlining of the pharmacy curriculum and brought together therapeutic information presented in the previous courses of Professional Practice, Clinical

Pharmacy and Therapeutics.

The courses were subdivided into blocks of study based on therapeutic specialty. Each block consisted of lecture, laboratory and recitation components, each presenting the important therapeutic concepts for integration and reinforcement of information. Numerous meetings of faculty with educational consultants were held to discuss course concepts, teaching and testing methods, the writing of behavioral objectives and motivation strategies. Each coordinator was asked to develop the following documents for the block:

1. Time needed (hours for lecture, laboratory and recitation)
2. Lecture guides
3. Reading lists
4. Recitation and laboratory materials and design (e.g., mini and maxi case studies, patient profiles, workshop and demonstration design)
5. Instructor references and background material

Guidelines were provided for the development of these materials:

1. Block materials should parallel and serve to achieve block objectives.
2. Block materials should serve not only to present information but extend and reinforce previous information presented in other blocks.
3. Block materials should be as complete as possible in order to serve as student reference material.
4. Block materials should stress the direct patient applicability of therapeutic data.
5. Laboratory and recitation activities should be used to develop communication, psychomotor and attitudinal skills.

Thus, each instructor was responsible for developing objectives, materials, and testing format for their particular block.

In order to determine the effect of such a teaching program and the resulting differential effects of the various blocks, a comprehensive evaluation model with instrumentation was developed in order to test the questions.

1. A block evaluation form was used to gather student feedback on the total block and on each segment at its completion (Exhibit 1). Students were asked to comment on the block's content and organization, the lecturer's characteristic style of presentation, laboratory and recitation instructor characteristics. This form was completed prior to the block examination.
2. An evaluation instrument was used to gather student feedback about the block examination (Exhibit 2). This form allowed each student to rate the fairness of the examination and its adherence to block objectives. Students could cite items that were confusing or surprising to them.
3. Recitation and laboratory instructor forms were administered for the instructor to comment on the faculty and student materials for the block (Exhibits 3 and 4). It also asked the instructor to rate student preparation, attitudes and feelings concerning the block.
4. Block examinations were administered utilizing question-answer format. These examinations were scored and analyzed by computer. The computer analysis identified good and bad questions which helped improve future testing and identified areas which were not effectively taught.

Since student involvement was felt to be the key to the success of PT during its maiden year, students were encouraged to see themselves as active participants and evaluators of this new learning process. The advisor system was an

established part of the course, thus the recitation instructor met with each student in his group of 9-12 students every three weeks to discuss the individual's progress, difficulties and perceptions of the course.

Lectures were used to present the bulk of the block data. Key to data presentation was (a dialogue rather than a pure lecture presentation) with high usage of student reference materials, lecture outlines, monographs, and audio-visual aids. Emphasis on direct clinical application of drug therapy concepts and the presenter's personal experiences were considered important to student learning. Each lecture was audio-taped and duplicate tapes were made available to any student for review.

Recitation was used to clarify, extend and integrate information presented in the lecture. Case study analysis was the major tool to reinforce therapy concepts and for exercise in problem solving. Communication skill development and group dynamics were other important emphases of the recitation.

Beyond the presentation of the lectures, the laboratory experience served to put into practice analytic, communication and psychomotor skills. Laboratory activities included dispensing and compounding prescriptions representative of the drug categories considered in each block; developing patient profile analysis in a conference setting of small student groups; simulated patient interview and triage using videotape; and workshops on such topics as medication administration and manipulation, and medical and surgical devices.

The laboratory also served to develop and challenge each student's ability to identify agents of a particular drug category through drug identification charts. Finally, it was used to familiarize the student with specific patient information available on disease entities and their treatment. The uniqueness of this course was the fact that together, the lecture, laboratory and

recitation all formed a complimentary and integrated system for learning pharmacotherapeutics.

PHILOSOPHY OF EVALUATION

Since Bond and Anderson were responsible for the course, an external consultant was asked to help with the evaluation process. The evaluation needed to do several things in order to be effective and helpful in terms of curriculum development and analysis of data. All the data collection needed to be used for decision-making and thus was based upon the following premises:

a. Data must be simple to collect internally. It was determined in advance what data was to be collected and what would be helpful in terms of understanding whether the program was making it or not. Since the data was collected internally, it allowed each individual to be able to see immediately the kind of feedback he was receiving about that block. Also, there was consistency for all blocks. That is, the 40 variables that were being measured in block one were also measured in block fourteen (Chart 1).

b. The data must provide feedback to the Director and instructors. In order for the Course Director to be able to make appropriate decisions about the data, he received the information immediately and was able to use it in order to make better decisions about the course. If there were problems, the instructors were able to make appropriate alterations in their block since they were able to immediately look at any of the data regarding their part of the course.

c. Students should see results from the data. The evaluator felt that if students see response from faculty as a result of their feedback, they are much more likely to continue to give feedback. Faculty received both positive and constructive feedback from their students.

They were encouraged to use the student feedback to make decisions about their own teaching and to explain their changes they were making to the students who were giving them the data. Thus, students could see the results of constructive feedback.

FORMAT OF DATA COLLECTION

There were three major types of data collected for this course:

(1) Demographic data was gathered on such factors as lecture hours, recitation hours, number of objectives, number of pages of handouts, etc.

(2) Course outcome data was related to student performance in the course. For example, student average in laboratories, student average in recitation, the results of examination in the course and the type of questions on the exam.

(3) Student feedback was the largest data base. It examined such factors as the student feelings about the fairness of the examination, whether they were prepared properly for it, whether there were any surprises (Exhibit 3). They were also asked to indicate the value of materials given prior to each block; such as lecture outlines and study guides. Outside readings were examined relating to the objectives as well as the number of hours required. Students were also asked their greatest mode of learning and the number of outside class hours used for audio-visual (Exhibit 1). They also evaluated faculty members in terms of how they progressed in the lecture, how they pace their presentation, their detail, etc. And finally, students were asked to determine the percentage of objectives met by the block.

RESULTS

Table 1 shows the results of data collected for all fourteen blocks of the course for the academic year 1978-1979. It should be noted that this paper is a description of the variables used in examining this course and is a profile of the course, its faculty and students. Having no control group does not diminish the usefulness of descriptive data for such a comprehensive course (8).

The general demographic data showed that the number of lecturers for each of the fourteen blocks ranged from one to four. The average was two for each block. The lecture hours for each of these blocks ranged from a low of eight to high of 32. The average was 15.7 hours per block with a S.D. of 7.59. The laboratory hours spent on each block ranged from zero in two blocks to six in one block. The average was 3.14 hours with a S.D. of 1.87. The number of objectives for each block ranged from 11 to 132.

Results of student performance show the laboratory average to be a low of 85.7 and a high of 100. The mean for the year was 90.5 with a S.D. of 4.48. In recitation, the low average was 81.5 and the high average of 100. The overall mean was 86.7 with a S.D. of 7.96. The results on the final examination for each of the blocks showed a low of 72.[illegible] and a high of 89.9. The average was 81.2 with a S.D. of 5.15.

An analysis of the number of questions and the type of questions on each one of these exams showed that examinations ranged from 31 questions to 100 questions with an average of 76.6 questions per block and a S.D. of 22.2. The types of questions on the exams varied. Multiple choice questions ranged from a low of five to a high of 100 with an average 43.5 and a S.D. of 28.3. True and false questions ranged from zero as a low to 45 as a high with an average of 16.1 and a S.D. of 16.0. Matching questions ranged from zero to

45 as a high with an average of 16.1 and a S.D. of 16.0. Matching questions ranged from zero to forty-five with an average of 18.7 and a S.D. of 15.4. One examination asked for definitions that accounted for 20 questions.

At the end of each exam, students were given an anonymous questionnaire to return (Exhibit 2). Of the class of 173, 53.3 averaged returning these feedback forms. This represents a 30.8% response. Of those responding, 83.9% (S.D. = 16.0) found the examination to be fair. This ranged from 50% on one block to 100% on another block. In terms of confusion on the examination, the range went from a low 17% confused on one exam to 59% on another exam. The average was 38.7% confusion with a S.D. of 17.6. Overall, 91% of students felt that the examinations adhered to the objectives of the course. This ranged from a low of 62% adherence to a high of 98% with a S.D. of 9.95. The final question asked about the exam was related to surprises. An average of 33.2% indicating that there were surprises on the examination for which they were not prepared. The range went from 15% on two examinations to 62% on another examination (S.D. = 15.5).

For the student evaluations of each block, the response ranged from a low of 44 to a high of 173. The overall average was 95.2 responses with a S.D. of 47.9. The range went from 25 to 72 responses in the first eight blocks. After block eight, the range went from 120 to 173. This was a result of faculty asking for evaluations in class rather than out of class. The overall average responding went from 55.0 overall to 79.3. (This suggests that haying students complete the information in class yielded substantially more feedback data.)

11.3% of the students found the lecture outlines to be too extensive. This ranged from zero to 43% with a S.D. of 15.1. 16.9% found the lecture outline to be too limited. This ranged from zero to 59%, with a S.D. of 19.2. The students indicated clearly which of the lecture outlines tended

to be most helpful for them and which were not. The same was true in terms of the study guide materials. An average of 13% found them to be too extensive ranging from zero as a low to 46% as a high. The S.D. was 14.5. 16.2% of the students found the study guide to be too limited with a S.D. of 17.9. This data ranged from zero to 59%. 18.5% (S.D. = 8.5) of the students found the readings pertinent to the objectives to be too extensive. Also, 8.5% found the readings to be too limited (S.D. = 10.5). This ranged from a low of 3% to a high of 39%.

When students were asked to identify the percent of objectives met in the course, 82.6% indicated that at least 90% of the objectives for that block were met. 17.4% felt that less than 90% had been covered in the course. This again added valuable longitudinal information about the block which could be used in assessing the relative strengths and weaknesses.

CONCLUSIONS

Innovative programs with subsequent, comprehensive evaluations, utilizing both product and process questions are rare in the field of education, much less pharmacy education. This paper has documented an attempt at creating a dynamic course within a school of pharmacy and the results that this course had upon the faculty and students. The pharmacotherapeutics course was a comprehensive design based upon the specific new goals and objectives of the school. Beginning with alternative conceptual models and faculty training workshops, the faculty was able to implement a realistic model for a team taught, multi-disciplinary course. Obviously, the process of this study is more important than the actual data. Seldom can one find in the literature a faculty that has gathered such extensive data based upon its teaching performance,

used that information for decision-making, and made public the information to its faculty, students, and the academic world. In summary, this description and the results should encourage other pharmacy educators to study new designs for educational presentations, to ask for often threatening data and to be open to change their behavior based upon the obtained information.

ACKNOWLEDGEMENT

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TABLE 1

	Block	Demographic Data: Lecturers	Lecture Hours	Recitation Hours	Lab Hours	Class Averages for: Laboratory Student Average (1 decimal)	Recitation Student Average (1 decimal)	Examination Student Average (1 decimal)	Exam Evaluation (students as evaluators): Examination Reliability (3 decimals)	Number Giving Feedback on Exam	Fairness (%)	Adherence to Objectives (%)	Percentage of Objectives met in Blocks: 100% N	90% N	80% N	60% N
Pharm.29	1. General Care of the Patient	4	10	4	4	100	100	81.0	0.527	Form not developed at this time						
	2. Dermatologic Agents	1	9	2	4	91.0	100	82.5	0.725	59	97	95	20	48	18	14
	3. Antiinfectives	1	33	8	6	95.3	82.7	74.8	0.805	33	61	97	63	35		2
Pharm.30	4. Immuno-Collagen Agents	1	10	2	2	86.3	100	85.0	0.960	39	90	90	60	20	8	4
	5. Hematologic Agents	1	14	4	0	no lab	80.0	87.1	0.954	40	100	95	59	30	9	2
	6. Oncologic Agents	1	8	2	1	93.1	89.0	89.9	0.879	60	95	99				
	7. Pharmaceutical Accessories	2	8	0	4	no grade	no grade	79.8	0.691	20	95	95	70	22	0	0
	8. Gastrointestinal Agents	4	20	6	4	85.7	80.6	72.1	0.852	54	87	89	55	35	10	0
Pharm.31	9. Renal Agents	1	12	2	2	89.5	81.8	78.3	0.936	43	98	98	62	32	6	0
	10. Respiratory-HEENT Agents	2	17	8	4	89.6	82.[illegible]	78.3	0.769	60	88	91	35	37	22	6
	11. Cardiovascular Agents	2	27	6	6	93.2	83.9	79.9	0.798	82	70	94	39	32	24	5
Pharm.32	12. Endocrine-Reproductive Agents	3	18	6	4	84.9	79.8	79.3	0.758	34	50	62	41	45	14	0
	13. Special Practice Roles	2	12	6	0	91.0	81.5	89.3	0.422	59	69	81	35	43	16	6
	14. Neuropsychiatric Agents	3	22	6	4	86.1	85.9	79.2	0.854	110	91	97	40	45	15	0

EXHIBIT I

Student's Evaluation of _____ Block. (Record answers on OP-Scan Standard Answer Sheet)

A. Materials:

1. The printed materials (handouts) applied for this block were _____ for use as a lecture summary.

   a) too extensive b) adequate c) too limited

2. The printed materials (handouts) supplied for this block were _____ for use as a study guide:

   a) too extensive b) adequate c) too limited

3. The selection of readings required for this block was _____ to meet the block objectives:

   a) too broad b) well balanced c) too narrow

4. In this block, I used readings for about _____ hours.

   a) 0-2 hrs b) 3-5 hrs c) 6-8 hrs d) 9-12 hrs e) 12 hrs

5. In this block, my greatest learning in course-scheduled activities came from:

   a) lectures b) laboratories c) recitations d) required readings

6. In this block, my greatest learning in non-scheduled activities came from using:

   a) suggested readings
   b) suggested audiovisual materials
   c) current journal articles on this subje
   d) study sessions with classmates

7. In this block, I used audiovisual materials outside class for about _____ hours (i.e., slides, films, videotapes, audiotape recording of block lectures obtained from AV Center).

   a) 0-2 hrs b) 3-5 hrs c) 6-8 hrs d) 9-12 hrs e) 12 hrs

B. Objectives

(Check one) The objectives for this block were met:

____ 100% ____ 90% ____ 80% ____ 60%

Objectives NOT met for this block: (list)

Achievement of block objectives could be improved by:

Student's Evaluation of _____ Block. (Record answers on OP-Scan Standard Answer Sheet)

C. Lecturers:

Use the following answer choices for each of the succeeding questions:

a) always
b) usually
c) half of the time
d) seldom or never
e) not applicable or not enough data to judge

Answer questions 8-23 for the first lecturer in this block; 24-39 for the second lecturer, and 40-55 for the third lecturer.

The lecturer ...

8.	(24) (40)	progressed smoothly and logically from one topic to the next	a-b-c-d-e
9.	(25) (41)	paced the presentation for easy understanding	a-b-c-d-e
10.	(26) (42)	expressed him/herself clearly and concisely	a-b-c-d-e
11.	(27) (43)	was heard in all parts of the lecture hall	a-b-c-d-e

The lecturer's presentation ...

12.	(28) (44)	was clearly related to the block objectives	a-b-c-d-e
13.	(29) (45)	had enough detail to allow me to meet block objectives	a-b-c-d-e
14.	(30) (46)	used audiovisual which expanded my understanding	a-b-c-d-e

The lecturer ...

15.	(31) (47)	was enthusiastic about his/her topic	a-b-c-d-e
16.	(32) (48)	shared personal experience(s) in this practice area	a-b-c-d-e
17.	(33) (49)	encouraged students to ask questions during lecture	a-b-c-d-e
18.	(34) (50)	encouraged students to ask questions after lecture	a-b-c-d-e

The lecturer's estimate of my background knowledge in the following courses was accurate:

19.	(35) (51)	biochemistry	a-b-c-d-e
20.	(36) (52)	microbiology	a-b-c-d-e
21.	(37) (53)	pathophysiology	a-b-c-d-e
22.	(38) (54)	pharmaceutics	a-b-c-d-e
23.	(39) (55)	pharmacology	a-b-c-d-e

Form developed by W.S. Bond, J.E. Anderson, PCPS 1979

Return to Dr. Bond

PHARMACOTHERAPEUTICS (Pharm. 29,30,31,32)

RECITATION Evaluation Block_____ Leader_____

I. Block Materials.
Recitations for this block could be improved by:

II. Recitation Leader
A. Is a good____, poor____ TEACHER (i.e., presenter of information) as demonstrated by:

Could improve his/her teaching by:

B. Fosters logical and free thinking: yes____ no_____;
Is a good____, poor____ RECITATION LEADER (i.e. discussion and question manager) as demonstrated by:

Could improve recitations by:

Allows me to answer questions: yes____ no____;allows me to ask questions: yes____ no____

C. In general
Requires of me: too much____; too little____; about right amount_____ of preparation for, and effort in recitations.
Requires of my class: too much____; too little____; about right amount_____ of preparation for and effort in class.
Is willing to answer all clarifying questions: yes____ no____
Makes clear to me how my performance has been evaluated: yes____ no____

III. My own performance in recitation could be improved by:

My group's performance in recitation could be improved by:

Further comments may be written on the reverse side.

Form developed by W.S. Bond, J.M. Anderson, PCPS 1979

Return to Dr. Bond

PHARMACOTHERAPEUTICS (Pharm. 29,30,31,32)

LABORATORY Evaluation Block_____ Leader_____

I. Block Materials
Laboratory experiences for this block could be improved by:

II. Laboratory Instructor

A. Is a good____, poor____TEACHER/PRACTITIONER ROLE MODEL as demonstrated by:

Could improve his/her teaching (i.e., presentation of information) by:

Could improve his/her role modeling (consider, for example, demonstration of patient-oriented communication, use of personal practice experiences for developing practical therapeutic applications, etc.)

B. In general
Requires of me: too much____; too little____; about right amount of preparation for and effort in laboratories_____.
Requires of my group: too much____; too little____; about right amount of preparation for and effort in laboratories_____.
Is willing to answer all clarifying questions: yes____, no____.
Makes clear to me how my performance has been evaluated: yes____, no____.

III. My own performance in this block's laboratories could be improved by:

My group's performance in this block's laboratories could be improved by:

Further comments may be written on the reverse side.

Form developed by W.S. Bond, J.E. Anderson, PCPS 1979

EXHIBIT 2

EXAMINATION EVALUATION FORM

Please help us improve the examination in this course by sharing your comments and suggestions.

1. Was this examination FAIR? ___yes ___no
   If NO, please explain.

2. Were any questions CONFUSING? ___yes ___no
   If YES, please explain.

3. Were you tested on material stated in block OBJECTIVES? ___yes ___no
   If NO, please explain.

4. Did anthing SURPRISE you on this test? If YES, please explain. ___yes ___no

Use back of page for further comments.
Please return this form to Dr. Bond.

Thanks

Form developed by W.E. Bond, J.R. Anderson, PCPS 1979

EXHIBIT 3

PHARMACOTHERAPEUTICS

Laboratory Instructor's Evaluation of _____ Block.

Please return this form after the last laboratory in the block. Your suggestions will be used by the Block Coordinator and Course Coordinator to plan future laboratories for this block and others. You may use the back for extensive comments. Thank you.

1. Materials provided for lab instructors in this block could be improved by: (consider volume, timeliness, completeness, quality, applicability, realism, etc.)

2. Objectives which should be included in this block's laboratories: (list)

3. Laboratory materials for students in this block could be improved by: (consider volume, selectivity, completeness, quality, degree of difficulty, timeliness, realism, currency, etc.)

4. Student preparation for laboratories in this block was:

   poor_____ adequate_____ thorough_____

5. On the average, student attitudes and feelings about this block were:

   negative_____ not expressed_____ neutral_____ somewhat positive_____

   enthusiastic_____

6. Laboratories in all blocks could be improved by: (consider planning, content, cases, style, time, timing, etc.)

EXHIBIT 4

Pharmacotherapeutics Course (Pharm 29, 30, 31, 32)

Instructors Evaluation Form for _____ Block

Evaluation by: Block Coordinator ___, Recitation Leader ___, Lab Instructor ___
(please evaluate ONLY the area in which you participated.)

Objectives (check one): The objectives for the lecture ___, recitation ___, lab ___ in this block were met 100% ___, 90% ___, 80% ___, 70% ___, less than 70% ___.

Objectives NOT met in this block's lect ___, recit ___, lab ___ were: (list)

Achievement of these objectives could be improved by:

Materials provided for student use in (check one): lect ___, recit ___, lab ___ appeared to be: less than adequate ___, adequate ___, more than adequate ___
Please explain:

Materials and guidance provided for instructor use in (check one): lect ___, recit ___, lab ___ were: less than adequate ___, adequate ___, more than adequate ___
Please explain:

Materials for use in (check one): lect ___, recit ___, lab ___, for this block could be improved by:

Other comments on the lect ___, recit ___, lab ___ for this block: